



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/695,061 | 10/28/2003 | Seong-Ho Kim | 5649-1168 | 5437 |

7590 11/16/2005

Julie H. Richardson, Esq.
Myers Bigel Sibley & Sajovec, P.A.
P.O. Box 37428
Raleigh, NC 27627

EXAMINER

LANDAU, MATTHEW C

ART UNIT PAPER NUMBER

2815

DATE MAILED: 11/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/695,061

Applicant(s)

KIM ET AL.

Examiner

Matthew Landau

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 October 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7, 30, 34 and 37-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-7 and 30 is/are allowed.
- 6) ☒ Claim(s) 34, 37 and 38 is/are rejected.
- 7) ☒ Claim(s) 39 and 40 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 34 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 34 recites the limitation "the gate protection liner" in the last line of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim Objections

Claims 34 and 37 are objected to because of the following informalities:

Regarding claim 34, the limitation "an angled profile that correspond to the angled..." should be changed to "an angled profiled that corresponds ~~correspond~~ to the angled..."

Regarding claim 37, the limitation "directly contacting gate electrode sidewalls and the top portion" is objected to. It is suggested the limitation to be changed to read, "directly contacting ~~gate electrode~~ the sidewalls and ~~the top portion~~ of each gate electrode", or "directly contacting the gate electrode sidewalls and the top portions ~~portion~~".

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 37 and 38 are rejected under 35 U.S.C. 102(b) as being anticipated by Koga (US PGPub 2002/0079492).

Regarding claim 37, Figures 2 and 3 of Koga disclose a self-aligned contact structure comprising: two adjacent gate electrodes 103/104 on a substrate 101, each gate electrode having a top portion 104 narrower than a bottom portion 103 and sidewalls; a silicon nitride liner 106/105 directly contacting the gate electrode sidewalls and top portions; and a self-aligned contact pad 113a between the adjacent two gate electrodes to be electrically connected to the substrate between the adjacent two gate electrodes, the self-aligned contact pad protruding from a top surface of each gate electrode.

Regarding claim 38, Figure 3 of Koga discloses a buffer insulating layer 109 between the silicon nitride liner 106/105 and the self-aligned contact pad 113a at the top portion 104 of each gate electrode 103/104.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cronin et al. (US Pat. 6,734,564, hereinafter Cronin) in view of Lee et al. (US PGPub 2002/0195672, hereinafter Lee).

Regarding claim 34, Figures 4 and 5a-5c of Cronin disclose a first and second gate electrodes (20 and 22) disposed on a semiconductor substrate 12, the gate electrodes having opposing first and second sidewalls and top and bottom surfaces, wherein portions of the adjacent sidewalls of the electrodes are configured to angle generally downwardly and inwardly toward each, a contact window 78 positioned between the adjacent sidewalls of the first and second gate electrodes, wherein the contact window sidewalls comprise an angled profile (at the bottom portion) that corresponds to the angled gate electrode sidewalls; a contact pad 92 disposed in the contact window, the contact pad extending generally downwardly and having a length (height) that is greater than the height of the gate electrode; and a buffer insulation layer 90 disposed in an upper and/or intermediate portion of the contact window intermediate the contact pad and the gate protective liner layer 14. Note that Cronin discloses conductive lines 42 and 44, which correspond to conductors 20/22, are gates (col. 4, lines 17-21). The difference between Cronin and the claimed invention is a peripheral circuit region comprising a gate electrode; lightly doped impurity regions on each side of the gate, and heavily doped impurity

Art Unit: 2815

regions surrounding the lightly doped regions (i.e., an LDD structure). Figure 3 of Lee discloses a peripheral circuit region b comprising a gate electrode 19 with an LDD structure. In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Cronin by including a peripheral circuit region including a gate with an LDD structure for the purpose of integrating different types of transistors on the same chip, while reducing short channel effects in the peripheral transistor(s), which is well known in the art.

Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nishigohri (US Pat. 5,874,331).

Regarding claim 37, Figures 11-13 of Nishigohri discloses a self-aligned contact structure comprising: two adjacent gate electrodes 405 on a substrate 401, each gate electrode having a top portion, a bottom portion, and sidewalls, a silicon nitride liner 440/410 directly contacting the gate electrode sidewalls and top portions; and a self-aligned contact pad 465 between the adjacent two gate electrodes to be electrically connected to the substrate between the adjacent two gate electrodes, the self-aligned contact pad protruding from a top surface of each gate electrode. The difference between the structure shown in Figure 13 of Nishigohri and the claimed invention is the top portions of the gate electrode being narrower than the bottom portions. Figures 4 and 6 of Nishigohri disclose gate electrodes having top portions narrower than bottom portions. In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Nishigohri (the embodiment shown in Figure 13) by using the tapered gate structure shown in Figures 4 and 6,

Art Unit: 2815

which results in the top portion being narrower than the bottom portion. The ordinary artisan would have been motivated to modify Nishigohri (Fig. 13) in the manner described above for the purpose of increasing the efficiency of the silicide reaction. The efficiency is increased because it becomes easier to deposit the refractory metal used for the formation of the silicide (element 430 in Fig. 11) when the sidewalls are slanted (col. 9, line 55 – col. 10, line 6).

Allowable Subject Matter

Note that the allowability of claim 34 has been withdrawn in light of the new grounds of rejection presented above.

Claims 1-7, and 30 are allowed.

The reasons for allowance were provided in the Office Action mailed February 9, 2005.

Claims 39 and 40 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Regarding claim 39, the prior art of record, either singularly or in combination, does not disclose or suggest the combination of limitations including the buffer insulation layer comprises a silicon oxide layer.

Regarding claim 40, the prior art of record, either singularly or in combination, does not disclose or suggest the combination of limitations including the silicon nitride liner contacts the self-aligned contact pad at the bottom portion of each gate electrode abutting an interior liner thereat to define a thicker covering at the bottom portion of the gate electrode than other parts.

Art Unit: 2815

Response to Arguments

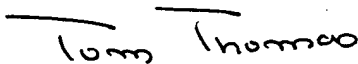
Applicant's arguments with respect to claim 37 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew C. Landau whose telephone number is (571) 272-1731.

The examiner can normally be reached from 8:30 AM - 5:30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone numbers for the organization where this application or proceeding is assigned are (571) 273-8300 for regular communications and (571) 273-8300 for After Final communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should any questions arise regarding access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


TOM THOMAS
SUPERVISORY PATENT EXAMINER

Matthew C. Landau

November 12, 2005